REMARKS

Applicants wish to thank the Examiner for the very thorough consideration given the present application. The Office Action of **June 25, 2001** has been received and its contents carefully noted. Filed concurrently herewith is a *Request for a Three (3) Month Extension of Time* that extends the shortened statutory period for response to **December 25, 2001 (Federal Holiday)**. Accordingly, Applicants respectfully submit that this response is timely filed and fully responsive to the *Office Action*.

Claims 24-75 were pending in the present application prior to the aforementioned amendment. By the above amendment, claims 24, 31, 32, 40, 41, 49, 50, 55, 56, 59-63 and 66-70 are amended and new claims 76-92 were added to better encompass the full scope and breadth of the invention. This action notwithstanding, Applicants believe that the claims would have been allowable as originally filed. Accordingly, Applicants assert that no issue of new matter is presented and no claims have been narrowed within the meaning of *Festo*. Accordingly, claims 24-92 are pending herein, and, for the reasons set forth in detail below, are believed to be in condition for allowance.

The new claims recite a method of fabricating a semiconductor device by forming a semiconductor film; performing a laser irradiation to the film; and then rapidly thermally annealing the semiconductor film with a strong light in accordance with the fourth exemplary embodiment described in the specification. No new matter is added by the new claims.

Applicant would like to thank the Examiner for pointing out the informal removal of the term "promoting" in claims 24, 41 and 50. Please note that, by the above amendment, each of the aforementioned claims is corrected so that the recitation "promoting crystallization" is recited. Note further, however, that the recitation "said catalyst material being capable of promoting crystallization" is formally amended to recite "said catalyst material accelerating crystallization." This amendment is supported in the specification at least on page 7, lines 9, 10, 14 and 15.

Initially, the *Office Action* reject claims 31, 40, 49-58, 62 and 69-75 under U.S.C. §112, second paragraph as indefinite. With regard to claim 50, because the steps are performed sequentially, one of ordinary skill in the art would recognize that the recitation "said semiconductor

film" is in reference to the crystallized semiconductor film. Reconsideration and withdrawal of the rejection is requested.

Regarding claims 71-75, specifically, Applicants' use of the acronym "CPU," Applicants respectfully contend that one of ordinary skill in the art would recognize that the acronym "CPU" is in reference to a central processing unit. It should be noted that claim terms should be given their ordinary meaning to those skilled in the art, unless the specification or file wrapper clearly articulates that a different meaning is appropriate. *York Prods., v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1572 (Fed. Cir. 1996). Accordingly, since neither the specification or file wrapper provides a definition of "CPU" which is contrary to its ordinary meaning, Applicant contends that one of ordinary skill in the art of semiconductor fabrication would clearly interpret "CPU" as referencing a central processing unit. Accordingly, reconsideration and withdrawal of the rejection is requested.

Regarding claims 31, 40, 49 and 55, by the above amendment, each claim is amended. In particular, claims 31, 40, 49 and 55 are amended so that the recitation "said light melts" recites "said light momentarily fuses." Note, however, that in accordance with the claimed invention, subsequent to the first heating which crystallizes the amorphous semiconductor film, the crystallized semiconductor film is irradiated and the surface of the semiconductor film is momentarily in a fused state so as to accelerate crystal growth in minute portions of the semiconductor film. As a result, the crystallinity ratio of the semiconductor film is improved by performing the irradiating step. Because, however, laser irradiation does not reduce defects in the irradiated film, a second heating is performed in order to reduce the defects. (See, page 14, lines 26 et seq. to page 15, line 5). Accordingly, no issue of new matter is present in claims 31, 40, 49 and 55. Reconsideration and withdrawal of the rejection is requested.

The *Office Action* rejects claims 56-58 under 35 U.S.C. §112, first paragraph as nonenabling. By the above amendment, base claim 56 is amended to include the step "adding a catalyst material into the semiconductor film." Moreover, the crystallization step is amended so that it recites "crystallizing said semiconductor film by first heating with the catalyst material." Accordingly, these claims should be considered enabling to one of ordinary skill in the art. Reconsideration and withdrawal of the rejection is requested.

The *Office Action* rejects claims 24-55 and 59-63 under 35 U.S.C. §112, first paragraph as containing matter that is not supported in the specification. As previously solicited hereinabove, claim 56 is amended to clarify this ambiguity. Regarding claims 24, 32, 41, 50 and 56, by the above amendment, each claim is amended so that the recitation "at a temperature not lower than 450°C" recites "at a temperature in a range from 450 to 750°C," which the Examiner admits (page 4 of the *Office Action*) as being supported by the specification. Regarding claims 31, 40, 49 and 50, as previously solicited hereinabove, each claim is amended so that the recitation "said light melts" recites "said light momentarily fuses." Accordingly, reconsideration and withdrawal of the rejection is requested.

The *Office Action* rejects claims 24-75 under 35 U.S.C. §103(a) as unpatentable over ***Ohtani et al.*** (U.S. Patent No. 5,543,352) in view of ***Zhang et al.*** (U.S. Patent No. 5,529,937), or visa versa, optionally in view of ***Liu et al. '826*** and ***Zhang et al. '291***. Because each of the above amendments have cured the issues involving new matter, Applicants submit that foreign priority based upon the *Verified English Translation* of Japanese Patent Application No. 6-225851 is perfected. Accordingly, ***Ohtani et al.*** is inapplicable as prior art against the subject application. Withdrawal of the respective prior art rejections based upon ***Ohtani et al.*** is earnestly solicited.

The *Office Action* rejects claims 50-51, 53-55, 69 and 74 under 35 U.S.C. §103(a) as unpatentable over ***Mitanaga et al.*** (U.S. Patent No. 5,808,321). Applicants respectfully traverse this rejection in view of the remarks advanced hereinbelow.

The claimed invention is directed to a method of fabricating a semiconductor device including, *inter alia*, steps of forming an amorphous semiconductor film over a substrate having an insulating surface, introducing a catalyst material in contact with the amorphous semiconductor film, the catalyst material accelerating crystallization of the amorphous semiconductor film, first heating the amorphous semiconductor film to crystallize the amorphous semiconductor film, irradiating the heated semiconductor film with a light to proceed further crystallization of the heated semiconductor film, reducing defects in the irradiated semiconductor film by second heating at a temperature in a range from 450 to 750°C, and patterning the semiconductor film so as to form a plurality of semiconductor islands.

As the Examiner well knows, in formulating a rejection under 35 USC §103, the following four-level factual inquiry must be conducted: (1) determine the scope and content of the prior art; (2) ascertain differences between the claimed invention and the prior art; (3) resolve the level of ordinary skill in the pertinent art; and (4) evaluate objective evidence of non-obviousness. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). In essence, to establish a *prima facie* case of obviousness, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 180 USPQ 580 (CCPA 1974).

Applicants respectfully contend that the *Office Action* has failed to set forth a *prima facie* case of obviousness and that the claimed invention is patentably distinct over the prior art. For instance, ***Mitanaga*** appears to merely disclose forming a gate insulating film by sputtering at a substrate temperature of only 200-400°C after the irradiation step to improve the crystallinity of the semiconductor film. On the other hand, in accordance with the claimed invention, a second heat treatment is performed after an irradiating step but before a step of patterning the semiconductor film. This cannot be accomplished in view of the disclosure of ***Mitanaga*** since the patterning step should be performed before the gate insulating film (See, FIGs. 1C and 3C). Accordingly, since the proposed ***Mitanaga*** modification fails to expressly teach or implicitly suggest each and every feature of the claimed invention, Applicants respectfully request that the §103 rejection of the pending claims be reconsidered and withdrawn in view thereof.

For at least the reasons expressed hereinabove, Applicants respectfully submit that the pending claims are in condition for allowance, and thus, reconsideration is respectfully requested. Should the Examiner believe any further communications is desirable in order to place the application in even better condition for allowance, he/she is encouraged to contact Applicant's undersigned representative at the telephone number listed below.

Respectfully submitted,

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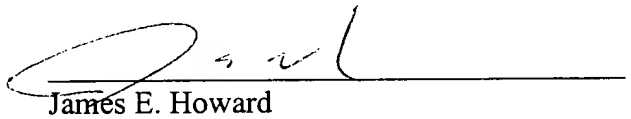

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MARKED-UP COPY OF AMENDED CLAIMS.

24. (Amended) A method of fabricating a semiconductor device comprising steps of:

forming an amorphous semiconductor film over a substrate having an insulating surface;

adding a solution including a catalyst material in contact with said amorphous semiconductor film, said catalyst material [being capable of promoting] accelerating crystallization of said amorphous semiconductor film;

first heating said amorphous semiconductor film to crystallize said amorphous semiconductor film;

irradiating [said crystallized] the heated semiconductor film with a light to [promote] proceed further crystallization of [said crystallized] the heated semiconductor film [after said first heating step]; and

reducing defects in [said crystallized] the irradiated semiconductor film by second heating [said crystallized semiconductor film] at a temperature [not lower than 450°C after said irradiating step] in a range from 450 to 750°C.

31. (Amended) A method according to claim 24 wherein said light [melts] momentarily fuses a surface of said semiconductor film in the irradiating step.

32. (Amended) A method of fabricating a semiconductor device comprising steps of:

forming an amorphous semiconductor film over a substrate having an insulating surface;

selectively adding a solution including a catalyst material in contact with a first portion of said amorphous semiconductor film while said solution is not added to a second portion of said amorphous semiconductor film, said catalyst material [being capable of promoting] accelerating crystallization of said amorphous semiconductor film;

first heating said amorphous semiconductor film so that crystal growth proceeds from said first portion to said second portion in a lateral direction with respect to said insulating surface;

irradiating [said crystallized] the heated semiconductor film with a light to [promote] proceed

further crystallization of [said crystallized] the heated semiconductor film [after said first heating step]; and

reducing defects in [said crystallized] the irradiated semiconductor film by second heating said [crystallized semiconductor film] at a temperature [not lower than 450°C after said irradiating step] in a range from 450 to 750°C.

40. (Amended) A method according to claim 32 wherein said light [melts] momentarily fuses a surface of said semiconductor film in the irradiating step.

41. (Amended) A method of fabricating a thin film transistor comprising steps of:

forming an amorphous semiconductor film over a substrate having an insulating surface;

selectively adding a solution including a catalyst material in contact with a first portion of said amorphous semiconductor film while said solution is not added to a second portion of said amorphous semiconductor film, said catalyst material [being capable of promoting] accelerating crystallization of said amorphous semiconductor film;

first heating said amorphous semiconductor film so that crystal growth proceeds from said first portion to said second portion in a lateral direction with respect to said insulating surface;

irradiating [said crystallized] the heated semiconductor film with a light to [promote] further crystallization of [said crystallized] the heated semiconductor film [after said first heating step];

reducing defects in [said crystallized] the irradiated semiconductor film by second heating [said crystallized semiconductor film] at a temperature [not lower than 450°C after said irradiating step] in a range from 450 to 750°C; and

forming a channel forming region in said semiconductor film using said second portion of the crystallized semiconductor film.

49. (Amended) A method according to claim 41 wherein said light [melts] momentarily fuses a surface of said semiconductor film in the irradiating step.

50. (Amended) A method of fabricating a semiconductor device comprising steps of:

forming an amorphous semiconductor film over a substrate having an insulating surface;

introducing a catalyst material in contact with said amorphous semiconductor film, said catalyst material [being capable of promoting] accelerating crystallization of said amorphous semiconductor film;

first heating said amorphous semiconductor film to crystallize the amorphous semiconductor film;

irradiating [said crystallized] the heated semiconductor film with a light to [promote] proceed further crystallization of [said crystallized] the heated semiconductor film [after said first heating step]; and

reducing defects in [said crystallized] the irradiated semiconductor film by second heating [said crystallized semiconductor film] at a temperature [not lower than 450°C after said irradiating step] in a range from 450 to 750°C; and then

patterning said semiconductor film so as to form a plurality of semiconductor islands.

55. (Amended) A method according to claim 50 wherein said light [melts] momentarily fuses a surface of said semiconductor film in the irradiating step.

56. (Amended) A method of manufacturing a semiconductor device comprising:

forming a semiconductor film comprising amorphous silicon over a substrate having an insulating surface;

adding a catalyst material into the semiconductor film;

crystallizing said semiconductor film by first heating [using a] with the catalyst material;

irradiating the crystallized semiconductor film with a pulsed excimer laser light to increase crystallinity of the semiconductor film after said first heating wherein one portion of said semiconductor film is irradiated with a plurality of shots of said pulsed excimer laser light,

reducing defects of the [crystallized] irradiated semiconductor film by second heating at a temperature [not lower than 450°C after the irradiation of said laser light] in a range from 450 to

750°C; and

forming a gate insulating film on the semiconductor film after the second heating.

59. (Amended) A method according to claim 24 wherein said [temperature of said second heating is lower than a strain point of said substrate] light is infrared light.

60. (Amended) A method according to claim 32 wherein said [temperature of said second heating is lower than a strain point of said substrate] light is infrared light.

61. (Amended) A method according to claim 41 wherein said [temperature of said second heating is lower than a strain point of said substrate] light is infrared light.

62. (Amended) A method according to claim 50 wherein said [temperature of said second heating is lower than a strain point of said substrate] light is infrared light.

63. (Amended) A method according to claim 56 wherein said [temperature of said second heating is lower than a strain point of said substrate] pulsed excimer light is selected from the group consisting of KrF, XeCl, XeF and ArF.

66. (Amended) A method according to claims 24 [wherein said temperature of said second heating is a range from 450 to 750°C] further comprising a step of forming source, drain and LDD regions in an active layer of the semiconductor film by introducing impurities therein.

67. (Amended) A method according to claims 32 [wherein said temperature of said second heating is a range from 450 to 750°C] further comprising a step of forming source, drain and LDD regions in an active layer of the semiconductor film by introducing impurities therein.

68. (Amended) A method according to claims 41 [wherein said temperature of said second

heating is a range from 450 to 750°C] further comprising a step of forming source, drain and LDD regions in an active layer of the semiconductor film by introducing impurities therein.

69. (Amended) A method according to claims 50 [wherein said temperature of said second heating is a range from 450 to 750°C] further comprising a step of forming source, drain and LDD regions in an active layer of the semiconductor film by introducing impurities therein.

70. (Amended) A method according to claims 56 [wherein said temperature of said second heating is a range from 450 to 750°C] further comprising a step of forming source, drain and LDD regions in an active layer of the semiconductor film by introducing impurities therein.